

REMARKS

This is in response to the Office Action mailed on December 10, 2004, and the references cited therewith.

Claims 1, 7, and 14 are amended. No claims have been added or canceled. Claims 1-23 are now pending in this application.

§112 Rejection of the Claims

Claims 14-23 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

The applicants respectfully traverse this rejection, but to advance the prosecution of this application without any intent to alter the scope of claims 14-23, the applicants have amended claim 14. In particular, the applicants have changed the recitation of "circuit" in the second and third elements of claim 14 to "substrate", such that claim 14 now recites "patterning a sensor element onto said substrate" and "patterning a heating element onto said substrate." Furthermore, the applicants, per the suggestion in the Office Action, have inserted "comprising" before the terms "opening up holes" in the eighth element of claim 14. The applicants have also amended the fourth element of claim 14 to recite "heating" rather than "beating." The applicants respectfully submit that these amendments overcome the rejection of claims 14-23 under section 112, and there being no further rejections of claims 14-23, hereby earnestly solicit allowance of those claims.

§102 Rejection of the Claims

The Office Action rejected claim 1-3, 6-8, 10-11 and 13 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,159,601 to Huber (hereinafter "the '601 patent"). The applicants respectfully traverse this rejection.

The present application, in an embodiment, discloses and claims a photonic frequency selection circuit. The circuit has a substrate 25, a resonator 20, heating element 35, temperature sensor 30, processor 40, and current source 45. (¶ 10). The tuning of the temperature of the

resonator 20 via the temperature sensor 30 and the heating element 35 changes the refractive index of the resonator 20, which thereby changes the frequency selected by the circuit. (§ 15). A precise listing of temperatures and frequencies are loaded into a logic device, and by selecting a temperature/frequency combination from the logic device, the frequency selected by the photonic circuit can be precisely selected. (§ 16).

The '601 patent discloses a tunable laser. The laser comprises in part a pump 10, a dichroic mirror 14, an optical fiber 16, and a mirror provided by a grating 18. The grating 18 is connected to a substrate 22 which has a heating element 24 and a thermistor 26. The period of the grating 18 determines the wavelength of light reflected within the laser. By physically stretching or contracting the substrate 22 to which the grating is attached, the period of the grating 18 is changed, thereby changing the wavelength of the light reflected within the laser. (Col. 2, lines 43-64).

The Office Action states that the '601 patent discloses a resonator in the form of a grating 18. The applicants respectfully traverse this contention. The grating 18 in the '601 patent is a mirror that depends on physical alteration of the period of the grating to determine the wavelength of light that is reflected by the laser. By contrast, the resonator recited in claim 1 of the present application has its refractive index altered by changes in temperature (or its refractive index is maintained constant by maintaining its temperature), thereby changing the frequency selected by the circuit. Since claim 1 recites a resonator, and the '601 application does not disclose a resonator, claim 1 is not anticipated by the '601 patent, and the applicant's earnestly solicit the allowance of claim 1. The applicants further solicit the allowance of claims 2-6, which depend on claim 1. The applicants further solicit the allowance of independent claim 7, which recites a resonator, and claims 8-13 which depend on claim 7 and also include the recitation of a resonator.

Furthermore, the applicants have amended claims 1 and 7 to more particularly point out and distinctly claim the invention. Specifically, claims 1 and 7 now recite that a temperature/frequency pair is retrieved from a logic device, and the temperature of the resonator adjusted to that temperature in order to precisely control the frequency selected by the photonic circuit. The '601 patent discloses a laser, not a photonic switch, and hence does not disclose the precise control of the present invention, but is only concerned with maintaining the wavelength

within a laser's gain bandwidth. Col. 1, ll. 40-45. Moreover, the '601 patent does not disclose either a processor or a memory such as disclosed by the present invention for the precise control of selected frequencies.

Lastly, in rejecting claim 13, the Office Action states that it is inherent in the operation of the circuit disclosed by the '601 patent that a wavelength for the resonator corresponds to a respective temperature, with a list of temperatures and wavelengths constituting a lookup table. The applicants respectfully traverse this contention. The '601 patent does not even disclose a processor or a memory. A table of temperatures and wavelengths therefore cannot be inherent. The applicants respectfully submit that the Office Action is improperly using the applicants' disclosure against the applicants, and request that this rejection be withdrawn.

The Office Action rejects claims 1, 3-4, and 6-7 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,498,878 to Ueda (hereinafter "the '878 patent"). The applicants respectfully traverse this rejection.

The '878 patent discloses a waveguide grating. The waveguide grating consists of an underlying clad 31, waveguides 14, and upper clad 33, deposited on a substrate 11. A heater 22 forms a zigzag pattern on upper clad 33. Col. 3, lines 39-49. The temperature of the waveguides is kept constant, thereby keeping the difference in lengths among the waveguides constant, which keeps the center wavelength of the output waveguides constant. Col. 4, lines 33-41.

The Office Action states that the waveguide grating 14 of the '878 patent is a resonator. The applicants respectfully traverse this contention. The temperature control in the '878 patent is directed to maintaining the different in length of the waveguides so that the output of the center waveguide remains constant. In the present application, the temperature of the resonator directly affects the refractive index of the resonator, thereby determining the frequency selected by the circuit. Consequently, the waveguides of the '878 patent are not resonators, and do not anticipate claim 1 of the application. The applicants further respectfully submit that claim 7, which recites a resonator, and claims 2-6, which depend on claim 1, are also distinguished over the '878 patent.

Furthermore, the applicants have amended claims 1 and 7 to recite that the photonic switch retrieves a temperature/frequency pair from a logic device, and sets the resonator at that temperature so as to precisely select the associated frequency. The '878 patent does not disclose

such a precise frequency selection scheme. Specifically, the '787 patent does not disclose a process or memory that is used to precisely select a frequency like that which is disclosed in the present invention. Also, the '878 patent discloses maintaining the temperature of a waveguide constant, so as the center wavelength of output wave guides are kept constant. The '878 patent is not concerned with selecting temperature frequency pairs in order to select a precise frequency in a photonic circuit. Consequently, claims 1 and 7, and their associated dependent claims, are patentable over the '878 patent.

The Office Action further rejects claims 1, 3, 6-8, and 10-11 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,438,277 to Eggleton (hereinafter "the '277 patent"). The applicants respectfully traverse this rejection.

The '277 patent discloses a thermally tunable optical device 9 that has an optical waveguide 10, thermally sensitive optical element 11, electrical resistance heater 12, current source 13, and a control circuit 14. The control circuit 14 has a microprocessor controller 15 and a resistance detector 16. The resistor detector 16 is coupled to the heater 12, and the output of the detector 16 is supplied to the controller 15. (Col. 2, l. 64 --- Col. 3, l. 11). The signal from the detector 16 to the controller 15 is used to stabilize the device. (Col. 3, ll. 37-38).

The present invention is not directed to stabilizing a device like the '277 patent, but rather, is directed to precisely controlling a photonic switch by selecting temperature/frequency data from a logic device, and adjusting the temperature of the resonator to that temperature, thereby precisely controlling the frequency selected by the photonic circuit. The '277 patent does not disclose such a precise temperature/frequency logic means to select a particular frequency. Moreover, the infinitely variable and precise control of the frequency selected by the present invention is not inherent in the '277 patent. Indeed, the '277 patent discloses only a conventional feedback loop to maintain the stability of the device (Col. 4, ll. 10-15), not extensive temperature/frequency logic to operate as an infinitely variable switch. Also, the '277 patent discloses only a single control signal to the microprocessor 15 (to *stabilize* the circuit against *ambient* changes, Col. 2, l. 35), not extensive temperature and frequency logic to infinitely and variably select a frequency as disclosed by the present invention.

§103 Rejection of the Claims

Claims 5 and 9 were rejected under 35 USC § 103(a) as being unpatentable over Huber (U.S. 5,159,601) in view of Koizumi (U.S. 5,696,543). Claim 12 was rejected under 35 USC § 103(a) as being unpatentable over Huber (U.S. 5,159,601) in view of Schwindt (U.S. 6,720,782). The applicants respectfully submit that in light of the amendments to claims 1 and 7, the rejections of claims 5, 9, and 12 under 35 USC § 103(a) are overcome, and that these rejections should be withdrawn.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at 612-373-6900 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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Date March 9, 2005

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: MS Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 9th day of March, 2005.

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